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What is claimed is:

1. A system for actively measuring at least one electrophysiological parameter of a region of a patient's brain and perform an action in response thereto, the system comprising:

a stimulation subsystem operative to apply an electrical stimulation signal to the region of the patient's brain;

a sensing subsystem operative to detect an evoked response to the electrical stimulation signal; and

a processor operative to calculate the electrophysiological parameter based on the evoked response and to initiate an action in response to the calculated electrophysiological parameter.

2. The system of claim 1, wherein the electrophysiological parameter comprises an excitability threshold of a neural pathway.

3. The system of claim 1, wherein the electrophysiological parameter comprises a refractoriness level of a neural pathway.

4. The system of claim 3, wherein the refractoriness level is representative of an inhibition period.

5. The system of claim 1, wherein the system further comprises a control module, and wherein the stimulation subsystem, the sensing subsystem, and the processor each forms part of the control module.

6. The system of claim 1, wherein the control module is disposed within a biocompatible housing.

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7. The system of claim 6, wherein the housing is implanted in the head of the patient.

8. The system of claim 7, wherein the housing is implanted intracranially.

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9. The system of claim 1, further comprising a stimulation lead having at least one stimulation electrode adapted to be implanted at a first location within the region of the patient's brain.

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10. The system of claim 9, further comprising a measurement lead having at least one measurement electrode adapted to be implanted at a second location within the region of the patient's brain.

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11. The system of claim 1, wherein the stimulation subsystem is further operative to provide therapeutic stimulation.

12. The system of claim 1, wherein the stimulation subsystem is further operative to provide sensory stimulation.

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13. A system for actively measuring at least one electrophysiological parameter of a region of a patient's brain, the system comprising:

a stimulation subsystem operative to apply an electrical stimulation signal to the region of the patient's brain,

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a sensing subsystem operative to detect an evoked response to the electrical stimulation signal; and

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a processor operative to calculate the electrophysiological parameter based on the evoked response;

wherein the processor is further operative to perform an action in response to the calculated electrophysiological parameter.

5 14. The method of claim 13, wherein the action comprises the delivery of therapeutic electrical stimulation to a location in the patient's brain.

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15. The method of claim 13, wherein the action comprises providing a warning to the patient.

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16. A method for actively measuring an electrophysiological parameter of a region of a patient's brain, the method comprising the steps of:

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selecting a test value for the electrophysiological parameter;

performing a measurement using the test value of the electrophysiological parameter to receive a response; and

determining whether the response meets a criterion, and if not, adjusting the test value and repeating the testing and determining steps.

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17. The method of claim 16, wherein the electrophysiological parameter comprises an excitability threshold of a neural pathway.

25 18. The method of claim 17, wherein the performing step comprises the steps of:

applying an electrical stimulation pulse to a stimulation lead implanted in a first location in the region of the patient's brain; and

receiving a response signal with a measurement lead implanted in a second location in the region of the patient's brain.

19. The method of claim 18, wherein the determining step comprises identifying an
5 evoked response in the response signal.

20. The method of claim 18, further comprising the steps of:

repeating the applying and receiving steps at least once;

averaging the response signals to produce an average response signal.

21. The method of claim 16, wherein the electrophysiological parameter comprises a refractoriness level of a neural pathway, and wherein the refractoriness level is representative of
15 an inhibition period.

22. The method of claim 21, wherein the performing step comprises the steps of:

applying a first electrical stimulation pulse to a stimulation lead implanted in a first
20 location in the region of the patient's brain;

delaying a duration corresponding to the test value;

applying a second electrical stimulation pulse to the stimulation lead; and

25 receiving a response signal with a measurement lead implanted in a second location in the region of the patient's brain.

23. The method of claim 22, wherein the determining step comprises identifying a first
30 evoked response and a second evoked response in the response signal.

24. The method of claim 22, further comprising the steps of:

repeating the first applying step, the second applying step, and the receiving step at least once;

averaging the response signals to produce an average response signal.

25. The method of claim 16, wherein the adjusting step employs a linear search strategy.

26. The method of claim 16, wherein the adjusting step employs a binary search strategy.

27. The method of claim 16, further comprising the step of calculating the electrophysiological parameter if the response meets the criterion.

28. The method of claim 27, further comprising the step of performing an action in response to the calculated electrophysiological parameter.

29. The method of claim 28, wherein the step of performing an action comprises applying therapeutic electrical stimulation to a location in the patient's brain.

30. The method of claim 28, wherein the step of performing an action comprises providing a warning to the patient.